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MAR 31 1978



Southern Pine BEETLE NEWS



No. 10/JANUARY, 1978

New Research Funded

Researchers have been funded to develop and test models for predicting area-wide beetle population growth or trends and tree mortality. A user's guide for the land manager will result from this investigation. Investigators are F. M. Stephens and H. A. Taha of the University of Arkansas at Fayetteville.

Work will also start on thinning—involving several stand densities—as a means of preventing or reducing beetle attacks on plantations and natural stands. T. E. Nebeker and B. L. Karr at Mississippi State University, and R. R. Hicks, Jr., and J. E. Coster at Stephen F. Austin University will investigate this subject.

A new project at North Carolina State will complement population/stand hazard studies already under way at Texas A&M. The North Carolina researchers—F. P. Hain, G. E. Moore, and C. J. DeMars, Jr.—will correlate beetle activity with stands classed as low, medium, and high risk based on site/stand conditions thought to contribute most to infestation incidence and severity.

Since early summer, two Texas A&M scientists, R. N. Coulson and P. E. Pulley, have been determining the relationship between beetle population size and stand density, age, and species composition.

Beetle Aggregation Studied on Shortleaf Pines

Arrival patterns of southern pine beetles were studied on 18 shortleaf pines initially baited with newly attacked bolts. All trees were located next to natural infestations of SPB to insure quick attack and high populations. Artificially infested bolts—with males only, females only, and males and females—were used to trigger attacks. Trees with uninfested bolts served as controls. Beetle arrivals were monitored with two sets of sticky traps suspended at several heights on opposite sides of each study tree.

Beetles did not mass attack pines baited with males alone or with uninfested bolts. But trees baited with females alone or with male and female bolts came under mass attack within 24 hours.

Traps located 3-4 meters above the ground caught the highest percentage (26.7%) of beetles trapped overall. Although the baited bolts were hung at 5 meters, this probably made no difference because adjacent unbaited trees were most frequently attacked at 3-4 meters, too.

Flight landings generally increased by the hour from 9 a.m. to 5 p.m., except for a leveling off period during midday, 11 a.m. - 1 p.m. Peak arrival occurred in late afternoon, 5 p.m., after which landings decreased until darkness. Trap catches were highest on the third day after initial attack, then declined rapidly.

Trapped male beetles slightly outnumbered females, with an average ratio of 1 to 0.86. The sex ratio of beetles caught varied consistently both daily and over the attack period.

COSTER, J. E. ET AL.

1977. Aggregation of the southern pine beetle in response to attractive host trees. *Environ. Entomol.* 6(5):725-731.

Soil and Stand Features Reported For Infestation Spots in Two States

Investigators report that a number of soil, stand, and individual tree features are related to beetle infestations in the Piedmont and mountains of Georgia and on the Coastal Plain of North Carolina. The work is ongoing and analyses are incomplete, so findings are preliminary.

Field crews recorded 10 different characteristics of selected trees and stands—including species, age, size, bark thickness, and disease incidence—on 163 plots. Basal area, site index, stand density, and timber type (species composition) were also determined for each plot. The average infested stand in the mountains of Georgia was overmature, heavily stocked and slow growing. Infested natural stands in the Georgia Piedmont were mature and slow growing, while infested plantations were young, had large crowns, and had experienced no growth slowdown. Infested North Ca-

rolina coastal stands were heavily stocked and slow growing.

Soil/site conditions in infested stands were examined for landform, texture, water content, slope, and azimuth (aspect). Soil of infested mountain sites in Georgia tended to be dry or droughty, and was largely sandy clay loam. Soils in Piedmont stands had shallow "A" horizons and high clay content; they occurred on dry sites, and were eroded due to past land use. On the Coastal Plain, surface soils were sandy loam with sandy clay loam subsoils. The coastal sites were classed as moist.

Beetles in Georgia most often attacked shortleaf, pitch, and Virginia pines, while in North Carolina they appeared more frequently in loblolly pines. Beetle outbreaks in the Georgia Piedmont took place in the same areas where littleleaf disease had occurred, although beetle attacks were rarely associated with obviously diseased trees. This suggests that SPB attacks are associated with littleleaf sites, not littleleaf trees.

BELANGER, R. P., G. E. HATCHELL, AND G. E. MOORE.

1977. Soil and stand characteristics related to southern pine beetle infestations: a progress report for Georgia and North Carolina. *In* Proceedings, sixth southern soils workshop, southern forest soils council. [Charleston, S.C., October.] p. 99-107. [In cooperation with Dep. Agric. For. Serv., Soil Conserv. Serv., and Soc. Am. For.]

Time of Development is Key To Survival of SPB Generations

Two ways have been designed for mathematically estimating within-tree survival of beetle populations. Both methods point out the importance of time of development to brood survival.

The first technique, "total generation survival," calculates survival by analyzing the number of brood adults per parent adult as this relates to the length of time spent in the tree and height of attack. The other method, "survivorship," relates the number of brood adults per 100 eggs to the time spent in the tree at intervals along the tree bole.

From May through September for 3 years, workers sampled attacking adults, eggs, larvae, pupae-callow adults and emerging adults in each of five regions on individual loblolly pines. They examined 149 trees and made approximately 9000 measurements.

The generation survival model showed that beetle survival rate was more closely related to time of development than to height of attack. Mortality was

highest early in development and decreased as the broods matured. The same trends were indicated by the survivorship model.

Average brood emergence per attacking adult was slightly higher from the higher and lower portions of the infested bole than from the middle. Greater egg production per female beetle probably caused this difference, rather than some difference in overall brood mortality per 100 eggs. In general, mortality patterns were the same at all heights sampled in the study trees.

COULSON, R. N. ET AL.

1977. Survival models for within-tree populations of *Dendroctonus frontalis* (Coleoptera: Scolytidae). *Can. Entomol.* 109:1071-1077.

Alternatives to Lindane and BHC Tested in Field and Lab

A three-phase study seeking alternative pesticides to lindane and BHC for beetle control had promising results. First, 29 compounds were screened in the laboratory for basic toxicity to southern pine beetles. Seventeen of the 29 materials were more effective against the beetles than lindane was.

Researchers then tested the most promising compounds for their effectiveness under field conditions. Infested trees were felled and cut into short sections, samples of which were x-rayed to count the number of insects in each bolt. Each test chemical was sprayed on a separate bolt, then the bolts were placed in cages under forest conditions. Untreated infested bolts were used for comparison. Emergence and mortality data were recorded daily.

Although this part of the study is incomplete, several chemicals showed promise for reducing beetle survival. The top six compounds in order of decreasing effectiveness were Reldan, Dursban, Sumithion, Santos-197, Pirimiphos-ethyl, and Permethrin. Lindane did poorly in this phase of testing.

The study also compared lindane and Reldan for protecting unattacked trees under field conditions. Three plots of 50 trees each were sprayed with 0.5% or 1.0% Reldan, or with 0.5% lindane. Fifty control trees were left unsprayed. Bolts taken from some of the treated trees were baited with frontalure and hung on trees undergoing attack. Treated bolts were also exposed to "forced" beetle attack under laboratory conditions.

After 25 days and at monthly intervals thereafter, researchers examined gallery length in field and lab bolts. Lindane was more effective in reducing gallery length (preventing successful attack) than either con-

centration of Reldan. However, except for June and July, 0.5% Reldan was about as potent as lindane in reducing gallery length.

HASTINGS, F. L., A. S. JONES, AND C. J. KISLOW.

1977. Outlook for new insecticides for bark beetle control. In Lightwood research coordinating council, annual meeting proceedings [Atlantic Beach, Fla., January 1977.], p. 25-32.

1978 Work Program and Budget Approved

On September 19, 1977, Assistant Secretary of Agriculture Rupert Cutler approved the Program's plan of work and budget for 1978. Cutler gave the go-ahead after Research Coordinator Tom Payne presented plans and funding needs for the year at a meeting of the ad hoc Program Board in Washington.

Bob Thatcher, Program Manager, says that research on beetle impact on timber resources, recreation and aesthetic values, and watersheds will wind down at the close of 1978. Work on Reldan and Dursban and studies of salvage as a means of reducing loss will also draw to an end, as will parts of site/stand, population, and biological control research.

Studies of utilization of beetle-killed trees and of behavioral chemicals will continue beyond 1978. The same is true for population research aimed at creating life tables, devising biophysical models, and predicting beetle population/tree mortality trends.

Using knowledge gained from beetle/host/environment studies, investigators will begin in 1978 to develop and test hazard rating methods. Research will also be initiated on thinning as a way to prevent or reduce severity of beetle attack. In addition, the year will mark the start of an intensified effort to transfer knowledge from researchers to practitioners. This effort will include publication of a number of "how to" user's guides and popular articles.

Attack Behavior Varies Seasonally

Summer and spring landings of southern pine beetles on shortleaf pines were compared in east Texas. Researchers looked for seasonal differences in numbers of beetles per tree, distribution of beetles on the tree bole, daily flight behavior, and the sex ratio of attacking adults.

Twelve hardware cloth traps coated with Stickem Special were hung from 1 to 12 meters up the trees. Workers counted trap catches at 2 hour intervals for 11 days on 11 shortleaf pines adjacent to infested

trees — 4 in spring (May) and 7 in summer (July and August).

The average number of beetles caught per tree was about the same for spring and summer, as was the sex ratio. But, after initial attack, beetles mass attacked faster in spring than in summer.

In general, flight to the upper bole did not vary with season, except at 12 meters where the bugs were more active in spring than in summer. Arrivals at low level (3 meters and down) were greater in spring, and at midlevel (3-7 meters) they were greater in summer. Beetle flight was generally heavier in summer than in spring for each hour of the day.

COSTER, J. E.

1977. Seasonal variations in mass attack behavior of southern pine beetle. J. Ga. Entomol. Soc. 12(3):204-211.

Canadian and American Researchers Share Bark Beetle Expertise

Four Canadian Forest Service scientists from the Pacific Research Centre in Victoria, B.C., made a 10-day tour of the South in September and compared notes with SPB researchers. The Canadians specialize in spruce and mountain pine bark beetles. Researchers from the two countries exchanged views and shared expertise on population sampling, chemical attractants, microorganisms affecting beetles, and cultural and chemical methods of controlling beetles.

Site/Stand Researchers Aim for Southwide Model

The regional site/stand data analyst believes that it may be possible to construct a hazard-rating model for pine stands throughout the South. At an October site/stand workshop in Memphis, Richard L. Porterfield of Mississippi State University reported encouraging results from preliminary analyses of data from regional stands. He added, however, that there is much field work and data analysis yet to be done.

Researchers gave project updates and reaffirmed that older, denser, slower-growing stands, many of which have been disturbed by logging or lightning, are commonly associated with southern pine beetle attack. Virginia studies also pointed strongly towards the root rot *Heterovisidion annosum* (formerly called

Fomes annosus) as a factor predisposing stands to beetle attack on some sites.

Manmade disturbances — logging, prescribed burning, chemical brush control, and other procedures that may be considered management practices — probably have long-term benefits, although they may initially favor beetle attack. Data on several site/stand features, such as soil type, soil moisture content, bark thickness, land use history, root disease incidence, and host species seem to vary in different regions.

Researchers discussed publication of these findings and other site/stand data. In the upcoming year, several articles and, perhaps, one or two user's manuals for the forest manager will appear.

Technology Transfer To Intensify This Year

Starting this year, program scientists and information specialists will intensify their efforts to put the results of their research into the hands of practitioners. A series of "how to" booklets—between 15 and 20 in all—will be published over the next 3 years.

At least three, maybe four, manuals are on tap for this year. Their titles and subjects will be announced in a future *Newsletter*. All booklets will be written with a specific audience in mind, such as the forest manager, pest control specialist, suburban homeowner, small forest landowner, other researchers, contract logger, or managers in the wood products industry.

Investigators interested in putting out a "how to" should send the Program Manager an outline describing what the manual will be about and who will use it. Information Management in New Orleans will provide editorial help, and the Office of Communication in Washington will prepare layout and design. Researchers will receive full credit as authors.

Payne Honored By Texas Forestry Association

Thomas L. Payne, Research Coordinator for the USDA Southern Pine Beetle Program and a faculty member in the Entomology Department at Texas A&M, was honored by the Texas Forestry Association at its annual meeting in Beaumont in October. Payne has helped coordinate research on the southern pine beetle throughout the South and has made scientific contributions to the study of behavioral chemicals.

OTHER PUBLICATIONS OF INTEREST

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Ifju, G., P. C. Ferguson, and R. G. Oderwald.

1977. Pulping and papermaking properties of southern pine harvested from beetle-infested forests. 1977 TAPPI forest biology/wood chemistry conference [Madison, Wis., June], p. 169-176.

Sinclair, S. A., and G. Ifju.

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All publications are partially or wholly supported by the Southern Pine Beetle Program.

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